

## **DESCRIPTION FOR THE GENERAL PUBLIC (IN ENGLISH)**

The quality control mechanism is necessary to the organellar and cellular homeostasis. Organelles/cells remove abnormal cellular components, such as proteins misfolded during their synthesis and proteins damaged by exposure to stress (e.g. heat, UV, reactive oxygen species) and this process is essential for survival of cells and organisms. Indeed, many human diseases are causally linked to misfolding and accumulation of proteins. In order to keep the cells to always-optimal state, proteins that are no longer necessary also removed quickly. These quality control systems are focused in various cellular compartments including nucleus, endoplasmic reticulum and chloroplast.

Peroxisomes, single membrane-bound organelles that are ubiquitous in eukaryotic cells, function in various metabolic processes including lipid metabolism, biosynthesis of vitamins. In plants, these peroxisomal metabolic systems are switched flexibly dependent on changes of cellular status and plant developmental stages. During this process, the unnecessary peroxisomal proteins are degraded promptly and newly synthesized proteins are imported in peroxisomes. In addition, it is well known that peroxisomes produce hydrogen peroxide ( $H_2O_2$ ) in the course of their metabolism and since  $H_2O_2$  can be the source of the most highly reactive and toxic form of reactive oxygen species (ROS), peroxisomal proteins must be damaged by this process. Therefore, a quality control system that removes unnecessary, abnormal and toxic proteins is important for maintaining the optimal performance of peroxisomes.

Recently, we demonstrated that peroxisomal LON protease 2 (LON2) is responsible for degradation of unnecessary peroxisomal proteins and that its chaperone (not peptidase) function suppresses whole-peroxisome degradation processed by autophagy, which is an unprecedented mechanism. The main objective of the proposed project is to understand how LON2 chaperon function regulates autophagy and search for novel autophagy-regulating factors using Arabidopsis plants, in order to clarify the details of the quality control system in the plant peroxisome.

With this project, we will be able to know the artful strategy that plants have acquired over the evolution. On the other hand, because the autophagy system and LON protease are conserved in a wide range of organisms, the results from the project will be applied to the deep understanding of the basic mechanism of the quality control not only in plants but also in other organisms including human.